

## Social Evaluation of an Improved Cookstove Intervention Program in Nepal - A Case Study

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### Abstract

Transition to new technology is a gradual and challenging process in developing countries like Nepal. Shift to clean cooking is one of the prime focus, wherein national and international organizations are executing Improved Cookstoves (ICS) distribution programs. ICS are cleaner and more efficient options for cooking in rural areas of Nepal where electricity distribution is compromised. Despite technological advancements, due to limited consideration of social aspects, the beneficiaries are not using the distributed models as expected. This paper evaluates a case of an ICS dissemination program — particularly rocket and metallic stoves — conducted in 2019 through an international non-governmental organization based on social aspects. 163 out of 500 household beneficiaries were taken for the study from Baglung and Parbat districts of Nepal, wherein the concentration of distributed ICS were high. Survey and Key Informant Interviews were conducted to gather information on transition to clean cooking, infrastructural development, demography, health and psychology, institutional involvement, resource availability, political aspects and gender inclusion, community status, financial support and cultural aspect. The study found that 55.21% of the sampled households had the distributed ICS with them. Only 14.44% of them relied solely on ICS for cooking, and the rest depended majorly on Traditional Cookstoves (TCS) and Liquefied Petroleum Gas (LPG). 42.2% of ICS users had been using LPG as their alternative cooking solution. The distribution region lacked nearby ICS manufacturing facility. Some of the participants reported respiratory health issues and eye problems which could be due to use of TCS. Study also showed resistance among users for transition to ICS. Issues regarding fuelwood accessibility, operation and safety of ICS, food preference, and gender inclusion during distribution were minimal. It is concluded that authorities should conduct prior user study to refine their target households. Infrastructural development, institutional involvement and local stakeholder participation in decision making should be considered to promote the transition. This study recommends regular monitoring of grassroots level outcomes beyond distribution programs.

**Key Words:** *Improved Cookstoves, Intervention Program, Social Evaluation*

## 1. INTRODUCTION

Transition from traditional energy practices to modern and efficient ones are considered challenging in developing countries (Herington, Lant, Smart, Greig, & van de Fliert, 2017). Excessive dependency on fuelwood for cooking in traditional stoves are linked negatively with health and livelihood due to associated harmful emissions (Bruce, Perez-Padilla, & Albalak, 2000). Such cooking practices are however deeply rooted in rural lifestyle which gives rise to difficulty in the transition process (Bhojvaid et al., 2014). Improved Cookstoves (ICS) are being designed and disseminated globally via international organizations with an intention to reduce greenhouse gas emissions in developing countries (Johnson et al., 2009). Though such designs are fuel-efficient, they have compromised consideration of social aspects

(Bielecki & Wingenbach, 2014). Nepal has also been on the verge of shift towards clean cooking. Different national and international organizations working in the domain have been making efforts to ease the transition process by disseminating improved technologies. For instance, National Rural and Renewable Energy Program (NRREP) associated with Alternative Energy Promotion Center (AEPC), a governmental body in Nepal, has targeted distribution of 4.75,000 ICS in rural areas (HEDON, 2010). Social evaluation of such distribution has however not been conducted prior or after execution of such programs. This paper evaluates effectiveness of an ICS intervention program conducted in Nepal based on social aspects and suggests better possible pathways for dissemination of advanced technology among rural households facilitating better transition. The following sections are

divided into literature review, methodology, results and discussion, conclusion and recommendations.

## 2. LITERATURE REVIEW

Different studies conducted globally have shown that transition from traditional technology to modern ones need time and effort. Such transition occurs gradually rather than in leaps due to involvement of behavioral aspects of people under consideration (Murphy, 2001). Despite execution of multiple ICS intervention programs, such technology has not been accessible to poor and marginalized households (Troncoso, Castillo, Masera, & Merino, 2007) likely due to limited consideration of social aspects. Economic status of households seems to affect reach to modern technologies in studies (Aung et al., 2021). Even after obtaining the cookstove, households reach a saturation state when they decrease using the new product and switch back to their usual preference (Pine et al., 2011). It can be linked to resistance to change regular lifestyle among users. Usage area of cookstove plays an important role in determining whether the stove would be preferred for a sustained period of time (Bielecki & Wingenbach, 2014). Food preferences, cooking habits and rituals are strongly related with acceptance of ICS in everyday lifestyle (Mazzone, Cruz, & Bezerra, 2021). Patterns responsible for successful intervention programs have to be studied by analyzing social networks (Ramirez, Dwivedi, Ghilardi, & Bailis, 2014) and interlinkages between food security, social, economic, climate and environmental outcomes (Onah, Nyong, & Ayuba, 2021). Similarly, development of cooking practices should consider social setup (Herington et al., 2017). Not considering the social needs lead to use of other forms of cookstoves aside from the targeted ICS (Wang & Bailis, 2015). It has also been observed that excessive optimism of development planners causes failure of intervention programs (Khandelwal et al., 2017). To ensure long term and sustainable usage of disseminated ICS, trainings need to be provided (Bonan et al., 2021). The table below summarizes the studies conducted in international context.

**Table 1.** Summary of International Studies.

Reference	Region	Year	Addressed Social Issues for Transition to ICS
(Murphy, 2001)	East Africa	2001	Inhibiting factors
(Troncoso et al., 2007)	Mexico	2007	Social perceptions
(Pine et al., 2011)	Mexico	2011	Influencing factors and trend of ICS usage
(Ramirez et al., 2014)	Western Honduras	2014	Patterns for successful intervention
(Bielecki & Wingenbach, 2014)	Guatemala	2014	Culture and social perceptions and use of ICS
(Wang & Bailis, 2015)	India	2015	Socio-political processes
(Herington et al., 2017)	India	2015/16	Process in long-established energy practices
(Khandelwal et al., 2017)	India	2017	Affecting factors
(Onah et al., 2021)	Nigeria	2014-18	Inter-linkages
(Aung et al., 2021)	Malawi	2021	Energy access gap between ultra-poor and better-off households
(Bonan et al., 2021)	Mali	2021	Impact of training
(Mazzone et al., 2021)	Brazil	2021	Sociocultural drivers

International studies have focused on identifying factors affecting transition to ICS social, cultural and economic aspects, transition process and capacity development programs. (Murphy, 2001)(Pine et al., 2011)(Mazzone et al., 2021)(Khandelwal et al., 2017)(Troncoso et al., 2007)(Bielecki & Wingenbach, 2014)(Aung et al., 2021)(Herington et al., 2017)(Ramirez et al., 2014)(Onah et al., 2021)(Pine et al., 2011)(Wang & Bailis, 2015)(Bonan et al., 2021). Pertaining to the importance given in international studies and need in the national context, this study aims to identify factors affecting ICS adoption in Nepal based on social perspective, social parameters addressed by ICS intervention programs in the context of Nepal and ways to improve effectiveness of such programs.

### 3. METHODOLOGY

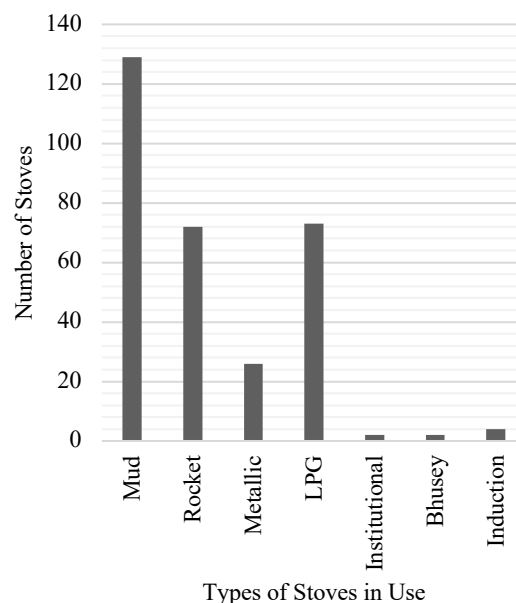
The main principle of this study is the uncertainty principle which highlights the fact that society is dynamic in nature which changes with time and from place to place. This study takes a case of an intervention program conducted in 2019 by an International Non-Governmental Organization of Nepal in Baglung and Parbat districts. The distributed model is a two-pot metallic model with chimney. The model has capability of primary and secondary combustion unlike traditional models in use. 163 out of 500 rural households (~30%) are taken for the study based on the record provided by the organization. The districts are selected due to high concentration and number of distributed ICS. Questionnaire guidelines were prepared so as to gather the information on development of region in terms of transition to clean cooking, infrastructural development, influence on demography, health and psychology, institutional involvement, resource availability, political aspects and gender inclusion, community status and transition, financial support and cultural aspect. Data were collected via in-person Key Informant Interview (KII) of local governance and survey of sampled number of households.

### 4. RESULTS AND DISCUSSION

#### 4.1 Development of Region in Terms of Transition to Clean Cooking

Of the 163 households sampled for the study, only 55.21% had the ICS with them (Rocket and Metallic type), although records showed that the households were provided with the ICS during the distribution program. Only 14.44% of those households were solely dependent on ICS for cooking. Rest had access to alternative cooking technologies such as mud stove or traditional cookstove (TCS) and LPG as shown in the figure 1.

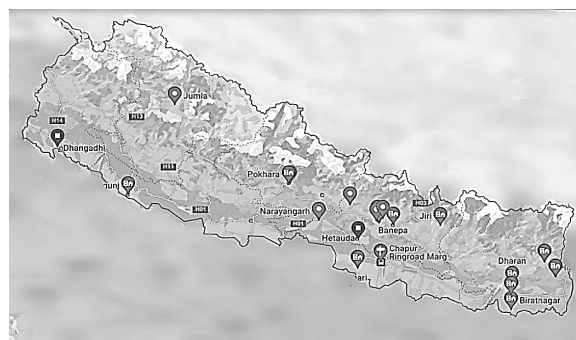
55.83% of the total households have been using cookstoves for both cooking and heating purpose. The rest have been using the cookstove for cooking purpose only. Dependency on LPG is significant among the households (45% of total). 42.2% of ICS users have also been using LPG as an alternative medium for cooking. This suggests that the development of the districts in terms of transition to ICS is not satisfactory.



*Fig.1: Types of Stoves in Use.*

#### 4.2 Infrastructural Development

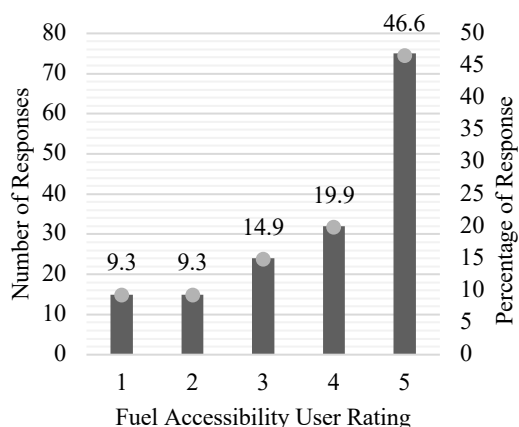
Baglung and Parbat districts do not have local manufacturing facilities of ICS. As per the data provided by AEPC (2019), the nearest production site lies at Pokhara as shown in figure 2 below. This suggests poor infrastructural development following the intervention program in the target districts.



*Fig.2: ICS Manufacturing Sites in Nepal.*

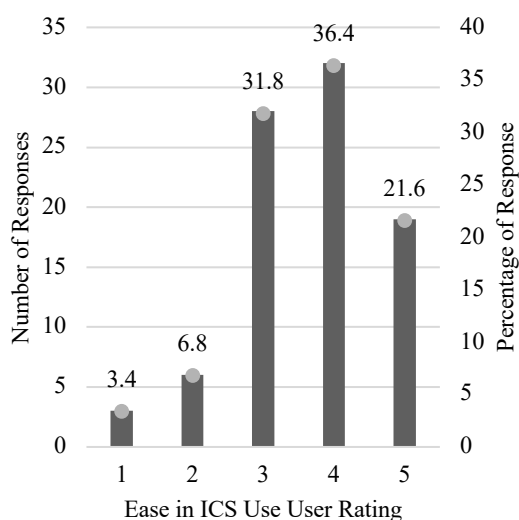
#### 4.3 Influence on Demography

When the users were asked to rate accessibility of fuel for ICS on increasing order of accessibility from 1 to 5, 46.58% responded it to be 5 as shown in Figure 3. The users have been gathering firewood from nearby forests.

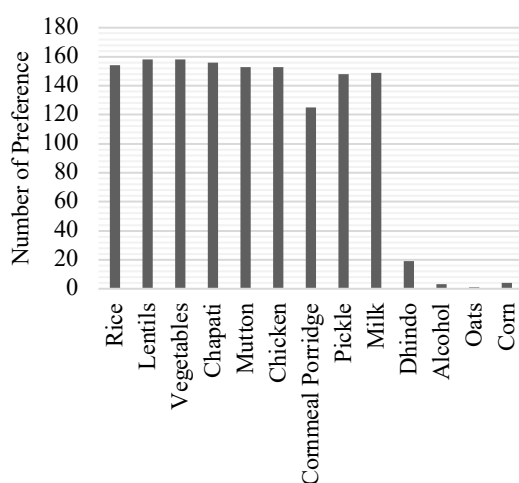


**Fig.3** Fuel Accessibility to Users.

The users also do not seem to have serious concern regarding ease in use of ICS. About 90% have given above average rating on a scale of 1 to 5, 5 being the easiest as shown in figure 4.



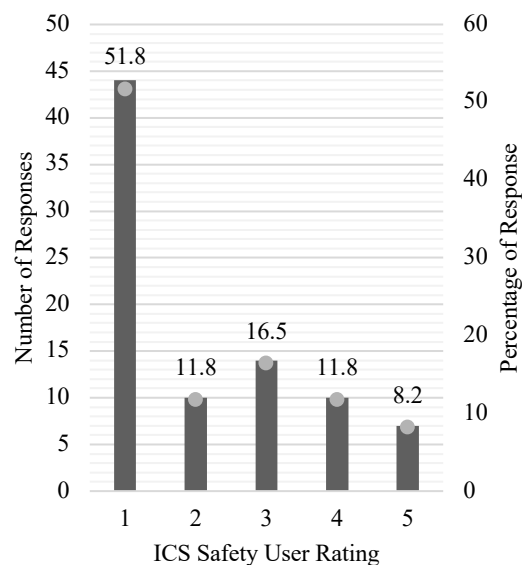
**Fig.4** Ease in Use of ICS.



**Fig.5** Types of Food Preferred by Users.

Figure 5 shows the types of food preferred by the local residents. The average number of food variety for sole ICS users and that for multiple cooking options is 9 suggesting use of ICS does not impact food preference compared to when other type of cookstoves are used.

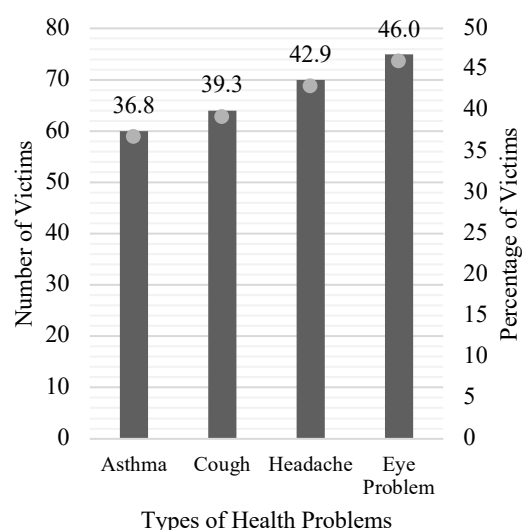
The users are however not confident with the safety aspect of ICS as shown in figure 6. About 63% of ICS users have given a low star rating (1 and 2) to the safety aspect, 5 being the safest.



**Fig.6** ICS Safety Perception among Users.

As only 14.44% have been using ICS as a sole cooking solution, it can be inferred that they do not find ICS convenient for use compared to TCS, LPG and other cookstoves.

#### 4.4 Health and Psychology



**Fig.7** Health Issues in Users.

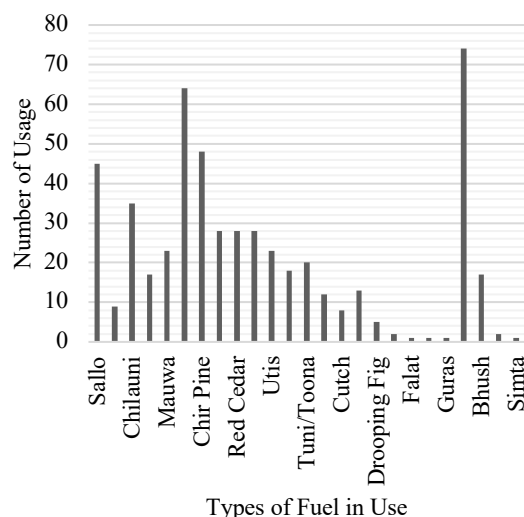
The participants showed health issues such as asthma, cough, headache and eye problems as shown in figure 7, irrespective of the use of ICS. This could be due to limited number of users who are reliant on ICS alone for cooking purpose. Since most of the participants are still dependent on TCS, their consideration towards transition from old behavior is not in favor on ICS (Figure 1).

#### 4.5 Institutional Involvement

As only 14.44% of the participants were using ICS alone, and most of them were still using TCS, the involvement of local and national entities in familiarizing the rural residents with the benefits of ICS needs more rigorous plan wherein ICS intervention programs could be targeted to residents with only TCS as their cooking alternative. Data shows that the distribution was done in greater share (76.07%) to those households with LPG or induction as alternatives. Identification of need-based stakeholders prior to the execution of distribution program may have been insufficient.

#### 4.6 Resource Availability

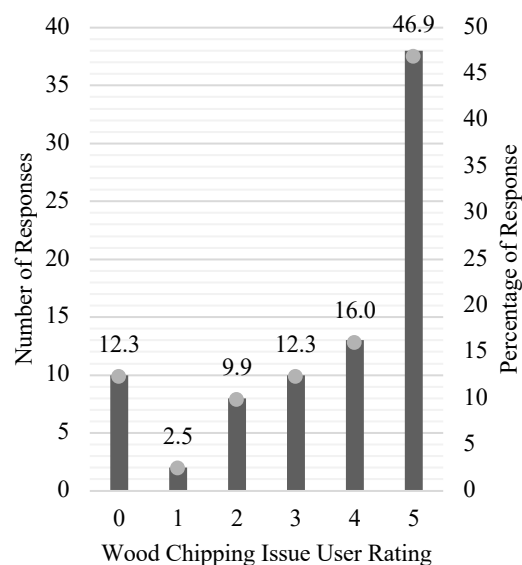
The residents have been using multiple sources of fuel as available in the nearby location without significant accessibility issue as discussed in section 4.3. Figure 8 shows that most of the users use Khoya and Needle Wood as raw materials.



**Fig.8** Types of Fuel in Use.

The users however demonstrated concerns regarding availability of chipping facility to make appropriately sized fuels for use in ICS. 46.91% have given a 5-star rating to wood chipping issue, 1 being the least concern as

shown in figure 9. This shows that access to equipment to make appropriate raw materials has to be addressed to aid the transition to ICS.



**Fig.9** Wood Chipping Issue in Users.

#### 4.7 Political Aspects and Gender Inclusion

Inclusion of stakeholders in decision making might have been compromised prior to program execution as observed from field survey. TCS users should be prioritized more distribution regulations to govern before and after scenario of intervention program. All of these factors are hindrances to transition to ICS. In case of gender inclusion, however, 58.9% were female users and the rest were male users suggesting comparable participation of both the genders.

#### 4.8 Community Status and Transition

TCS users would have been the key stakeholders for ICS distribution had there been institutional involvement in awareness campaigns. This was not considered for the intervention program due to which ICS users have been limited in the region. Lack of nearby community services and facilities have also hindered transition to ICS.

#### 4.9 Financial Support

Based on a KII done with the chairperson of Dhaulagiri Community Resource Development Center (DCRDC), Baglung, 50% of the total price (NRs. 6000) was provided by the distributing organization. The subsidy does not consider the background of stakeholders under consideration which makes the scheme unsustainable.

#### 4.10 Cultural Aspect

The users do not seem to portray changes in prior cooking practices (section 4.3). But, their consideration towards transition is not in favor of ICS. This could be due to availability of better cooking options such as LPG and induction stoves, or dependency on more commonly available TCS.

### 5. CONCLUSION

Transition to ICS in rural households require consideration of social aspects prior to execution of intervention programs. This paper has evaluated a case of ICS dissemination program conducted in Baglung and Parbat districts of Nepal from social perspective. KII and survey are done for local governance and sampled rural households respectively to gather data based on guidelines set for social evaluation. The actual number of households with ICS was different on field compared to that on record of the dissemination organization. It has been found that only 55.21% of the total households under consideration have ICS. Less than 15% of the participants were using ICS without depending upon the other alternatives such as TCS and LPG. The distribution program was limited at identifying appropriate stakeholders for ICS distribution. Local services and production facilities are not conducive towards ICS transition. Processing of raw materials is also found to be problematic in the target regions. Subsidy program was not found to be based on stakeholder's social and economic background. Governance to check and balance effect of intervention programs needs prioritization. Addressing these shortcomings would increase usage of ICS in the region and change current perception towards transition from old technology. Additionally in future studies, social evaluation may be conducted before, during and after implementation of ICS dissemination programs to better reflect upon the consideration of social aspects. Larger sample size of diverse regions could also provide refined insights on social evaluation of such programs.

### 6. RECOMMENDATIONS

The following recommendations are drawn from the study for ICS intervention programs:

- ICS intervention programs need inclusion of concerned stakeholders from rural community in decision making process.
- Regulatory bodies need to be established to

check the activities conducted by distributing organizations.

- Social needs must be addressed to increase social acceptance of new technology.
- Foundational information regarding socio-economic status of residents should be studied prior to distributing ICS.
- Local availability of resources needs to be weighed before implementing the distribution programs.
- Local processing and production centers need to be planned for sustainable intervention of new technology.

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